PUMA TL 2000 / 2500

High Productivity 4-Axis Turning Center

High Productivity
4-Axis Turning Center

The Puma TL series of machines is engineered to increase productivity through high efficiency. As a process-integrated machine the TL provides a new level of performance and capabilities.

PUMA TL 2000 / 2500

Main Spindle

The powerful built in spindle motor allows for a wide range machining operations, from precise finishing to high powered metal removal using both turrets at the same time.

PUMA TL2000/2000M

Max. spindle speed	Motor (Int./Cont.)
5000 r/min	22/15 kW

PUMA TL2500/2500M

| Max. spindle speed	Motor (Int./Cont.)
4000 r/min	26/22 kW

PUMA TL2000/2000M

Spindle motor power : 22kW(Built-in)
Max. Spindle speed : 5000 r/min
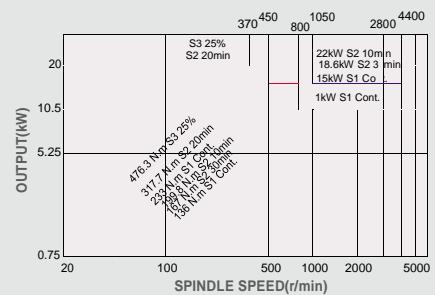
PUMA TL2500/2500M

Spindle motor power : 26kW(Built-in)
Max. Spindle speed : 4000 r/min

Oil Cooling Unit for Spindles

Motor is surrounded by an oil jacket cooling system to minimize thermal displacement and ensure consistency through a wide range of cutting conditions.

Tail Stock

The widely spaced guide ways and heavy-duty tailstock design ensures ample rigidity. The tailstock is positioned by a drive bar that engages with the carriage.

Tail stock quill type	unit	MT#5
Tail stock quill diameter	mm	100
Tail stock quill travel	mm	120
Tail stock quill thrust force	kN	17

Turret

Total 20 tool stations of upper (optional milling upper turret only TL2000M/2500M) and lower turrets make it possible to complete complicated parts requiring many tools in just one set-up. Reliable servo driven turrets reduce the total cycle time required to machine parts.

| Index time (1-station swivel)	No. of tool station (Upper+Lower turret)
0.15 s	**20** stations(12+8)

Radial BMT

The turret features BMT55P style tooling in which the toolholders are mounted directly to the turrets periphery using 4 large bolts.

## Rotary tool spindle power-torque diagram

Max. speed : 5000 r/min

OUTPUT (kW) vs SPINDLE SPEED (r/min)

Y-axis: 7.5, 4.5, 3, 1.5, 0.75, 0.1
X-axis: 20, 100, 250, 500, 1000, 2000, 3500, 5000

5.5 kW 3 25%
1.1 kW S1
47 N·m
14 N·m
750 1115 2500 4000

Rapid Traverse

Each axis is powered by a maintenance free digital AC servo motor. These high torque drive motors are connected to the ball screws without intermediate gears for quiet and responsive slide movement with virtually no backlash.
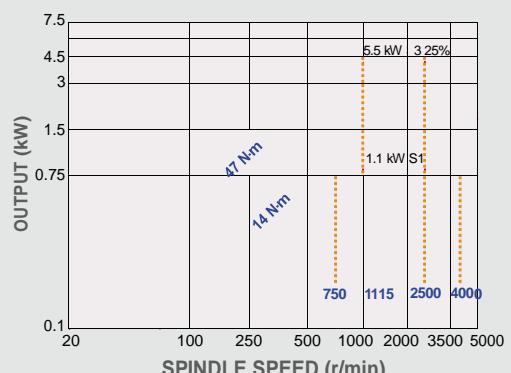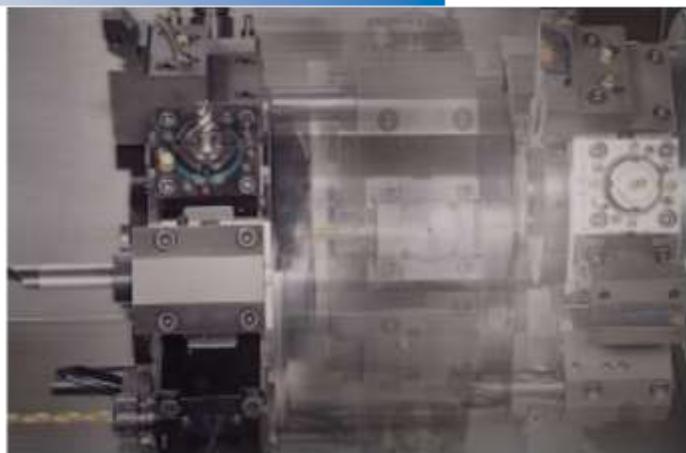
X-axis **20** m/min   Z-axis **24** m/min

Machine Construction

The combining of a high performance integral spindle motor with upper and lower multi-axis turrets yields a machine perfectly engineered for high productivity and optimum efficiency.
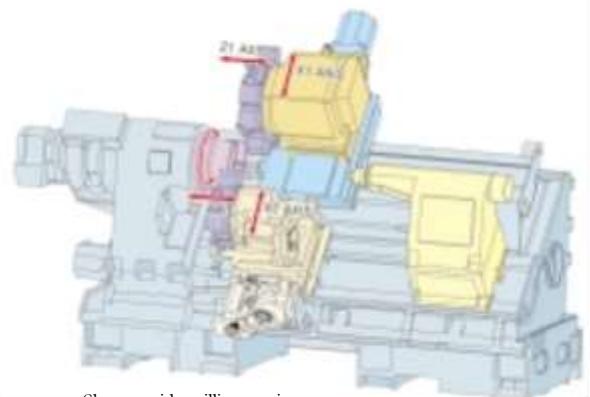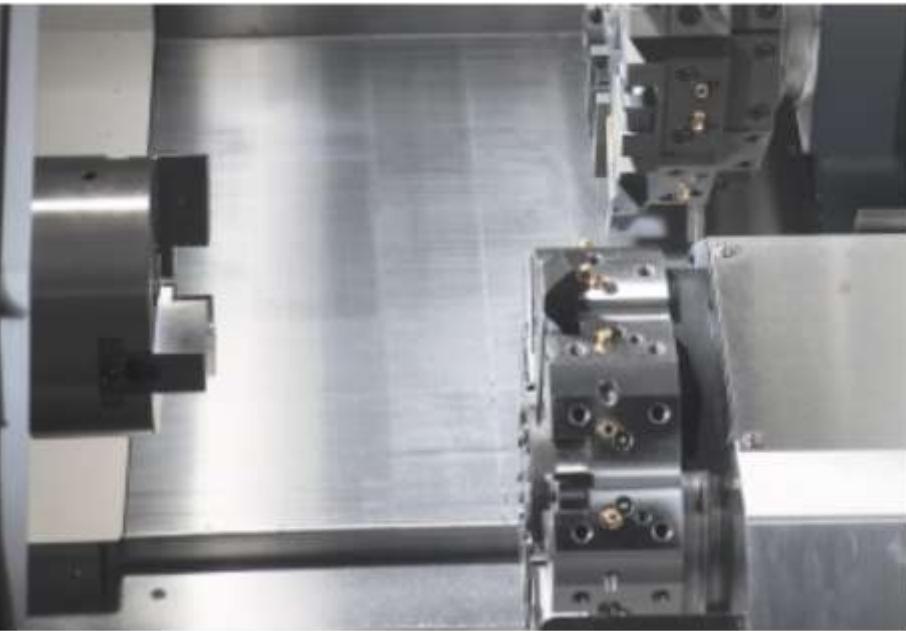
Shown with milling option

4-axis linear controlled machine establishes multi-axis functional performance with simultaneous control of both turrets for middle diameter shaft workpieces

Robust Design

The heavily ribbed triangular torque frame resists eccentric loads. A 45 inclined wall is inserted into triangular frame under the center of the frame, to endure high stress due to X direction forces.

FEM Structural Analysis
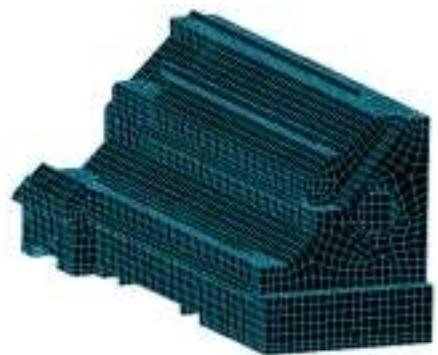
Torque Tube of Triangular Frame
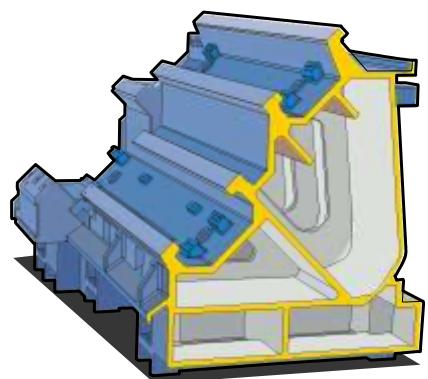
Machining Flexibility

Accuracy and time savings by virtue of a single set-up.
Unmanned operation by automation support.
Less floor space and increased productivity.

Long shaft working by follow rest operation to prevent chatter
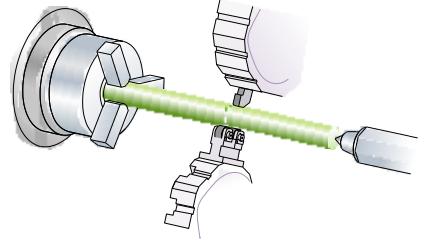
Balanced turning by 4-axis
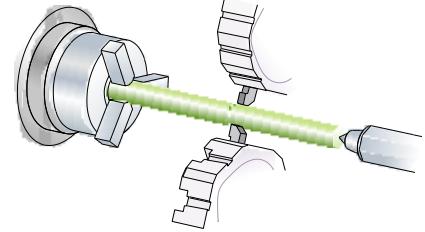
Simultaneous 4-axis turning
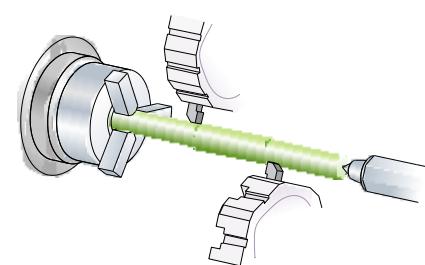
Working Range

Max. bar working dia.　ø65/76* mm
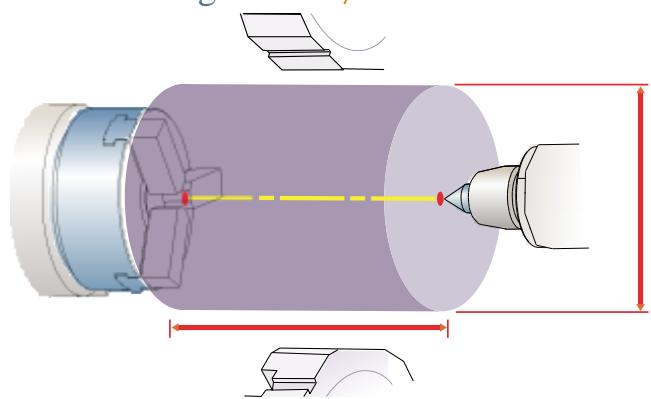
A : Max. turning dia.

370** mm (on upper turret)

240** mm (on lower turret)

B : Max. turning length

600 [1000] mm

* : on TL2500 series, [ ] : Long bed models
** : on TL2000[L] / TL2500[L]

Systemized Compact Structure

2900

3251[3898]

2049.7

Z1 - axis
X1 - axis
Z2 - axis X2 - axis
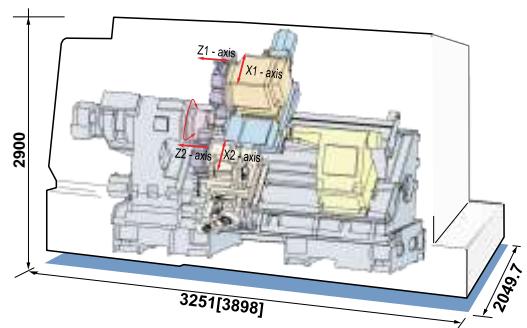
Travel	
X1-axis	Z1-axis
250 mm	650 [1050] mm
X2-axis	Z2-axis
150 mm	630 [1030] mm

Tooling System (Upper & Lower Turret)

unit : mm

PUMA TL 2000/2500

O.D Tool Clamper

Face Tool Holder

O.D Tool

□ 1

Extended Tool Holder

12st Upper Turret

8st Lower Turret

Boring Bar Sleeves

Boring Bar

ø1.6

ID HOLDER

ID Tool Holder(H1 ×3)

U-Drill Sleeves

U-Drill

Drill Socket

MT#1-H1×2
MT#2-H1×2
MT#3-H1×2

Drill

Holder Cover
for u-Drill

8

unit : mm

PUMA TL 2000M/2500M [Option]

- O.D Tool Clamper
- Face Tool Holder
- Extented Tool Holder
- Straight milling head
- Angular milling head
- Dummy Plug
- I.D Tool Holder(H1 1/2)
- I.D Tool Holder(H1 1/2)
- Face Tool Holder

- 12st Upper Turret (BMT55P)
- 8st Lower Turret

- O.D Tool □1
- Collet Adapter
- Milling Collets ER1
- Milling Arbor Adapter
- Weldon Adapter
- Boring Bar sleeves
- Boring Bar ø1.6
- U-Drill sleeves
- U-Drill
- Drill Socket
- Drill
- Holder Cover for u-Drill
- O.D Tool □1

unit : mm

PUMA TL 2000/2500

ø23.4(Max.Tool Swing)
ø14.6(Max.Turning Dia.)
(Upper)
ø17.1(Max.Tool Swing)

ø8.8
ø1.6
ø10.4
ø1.6
ø8.3
ø8.3
ø10.4
1.6
ø10.1
ø11
ø9.4(Max.Turning Dia.)
(Lower)

0.4

7.3   2.6
8.1   1.6 9.8(X1-Axis Stroke)
1.2   4.7
5.9(X2-Axis Stroke) 1.6   6.3
29.5

PUMA TL 2000M/2500M

ø13.8(Max.Turning Dia.)
(Upper)
ø22.8(Max. Tool Swing)
ø15.7(Max.Tool Swing)

ø9.1
ø8.8
ø10.4
ø1.6
ø1.6
ø8.5
1.6
ø1.3
ø10.4
ø8.5
ø11.0
4.9
0.7
Max.ø0.6
ø9.4(Max.Turning Dia.)
(Lower)

1.2   6.9   2.2
6.5   3.5 9.1(X1-Axis Stroke)
1.2   4.7
5.9(X2-Axis Stroke) 1.6   6.3
29.5

unit : mm

PUMA TL 2000[L]/2500[L]

OD tool holder
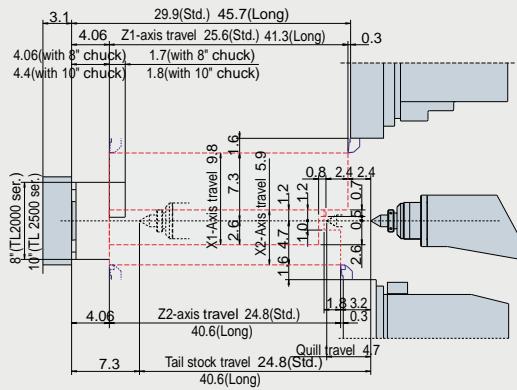
ID tool holder
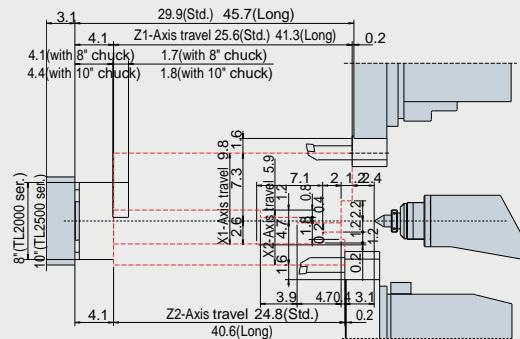
PUMA TL 2000M[LM]/2500M[LM]

OD tool holder
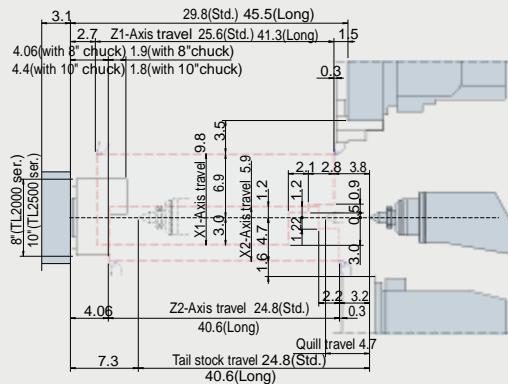
ID tool holder
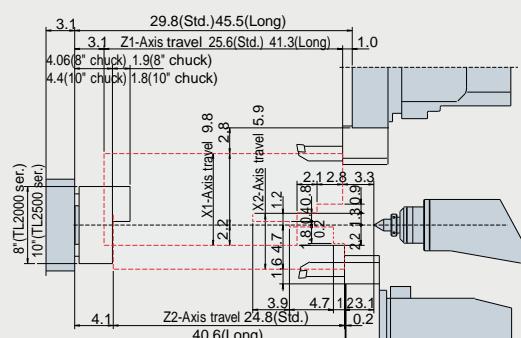


Angular milling tool holder(Option)

Straight milling tool holder(Option)
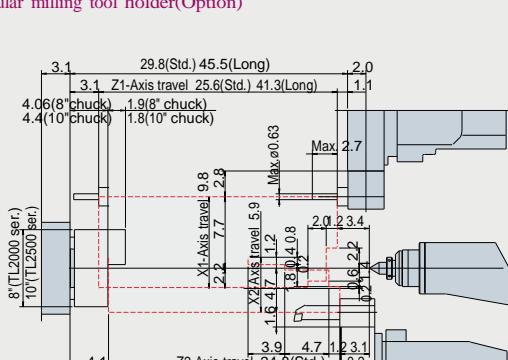
External Dimension

PUMA TL 2000/2500

Top View

Rear Chip Conveyor (Option)

Hyd. Unit

Side Chip Conveyor (Option)

652
120
125
2078
823
515
745(OPEN)
950
947

Front View

1930
1100
10
55(TL2000ser.)
100(TL2500ser.)
Spindle Nose
2905
403
FL0
3308
900
4208

Side View

Spindle Center

95
1930
1835
1100
10
93
530
1455
40
2078
2118
1198
1387

12
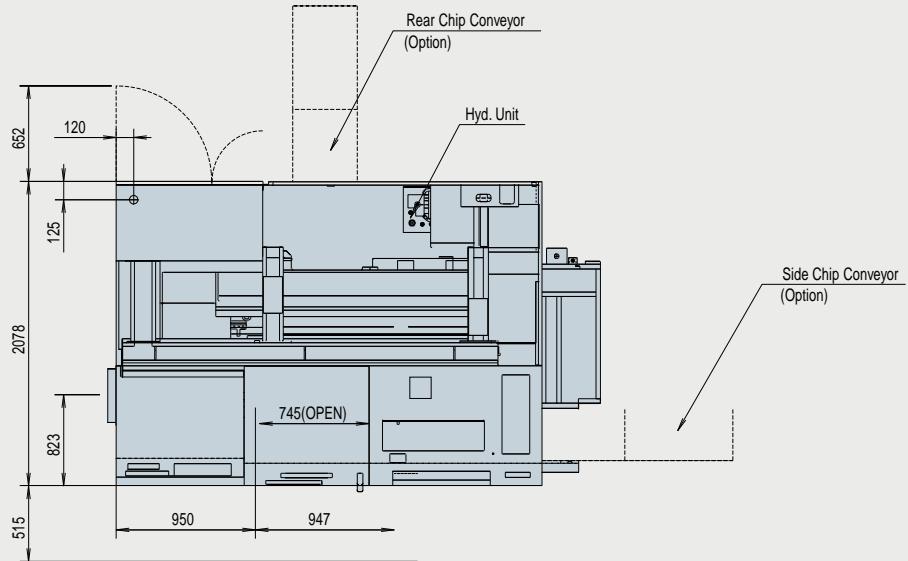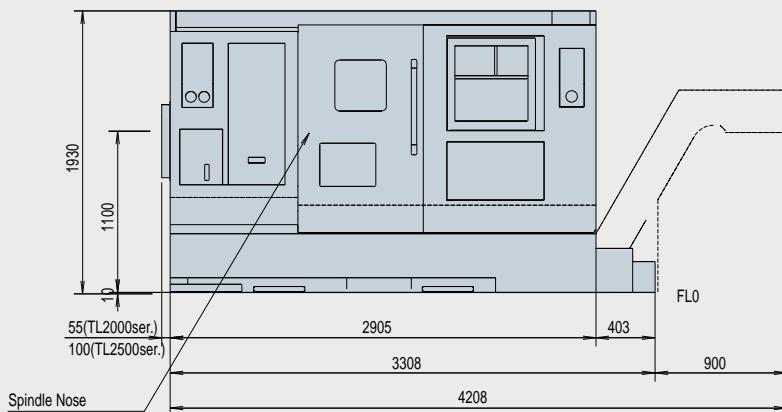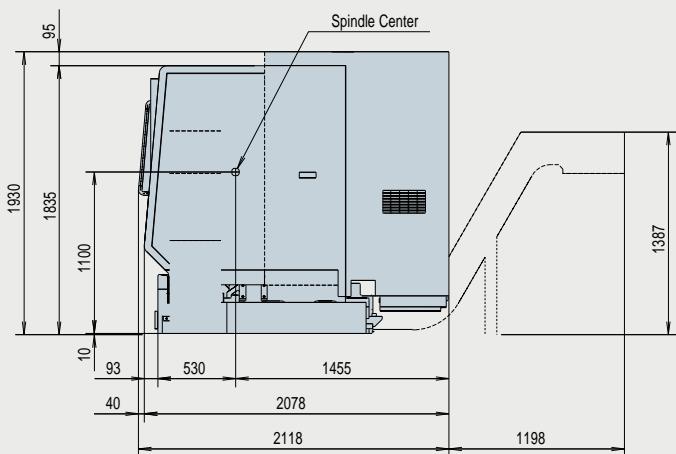
External Dimension

PUMA TL 2000L/2500L

Top View

Electrical Cabinet

652

120

125

Hyd. Unit

Spindle Nose

2078

Side Chip Conveyor
(Option)

623

925(L-OPEN)   5   210 (R-OPEN)

515

1070   1080

Front View

1930

1100

10

3810   403

4213   90

5113

FL 0

Side View

95

Spindle Center

1930

1835

1100

10

93   530   1455

66   2078

2144

13
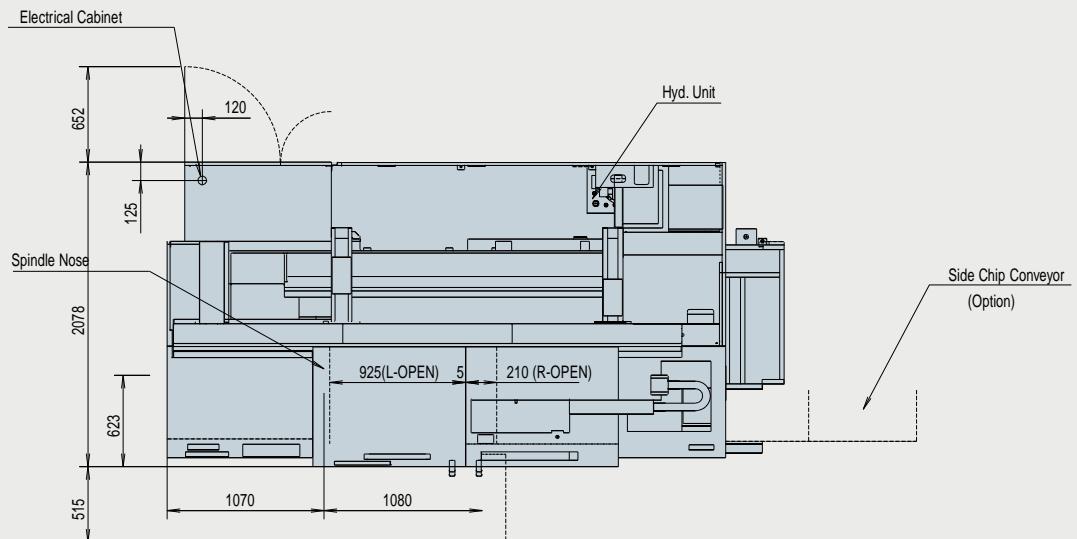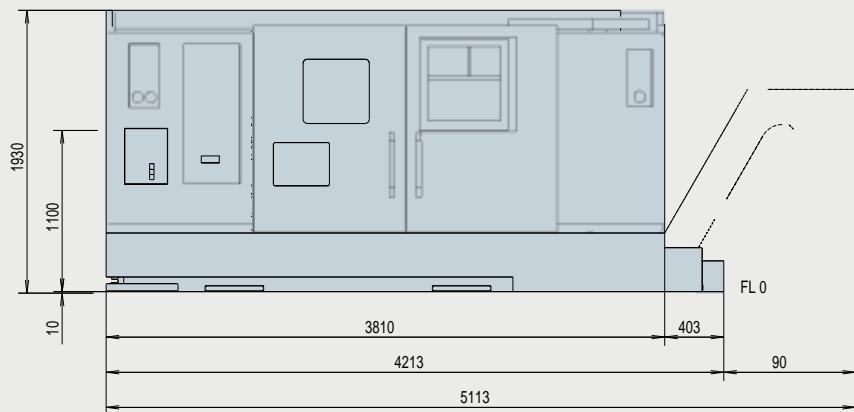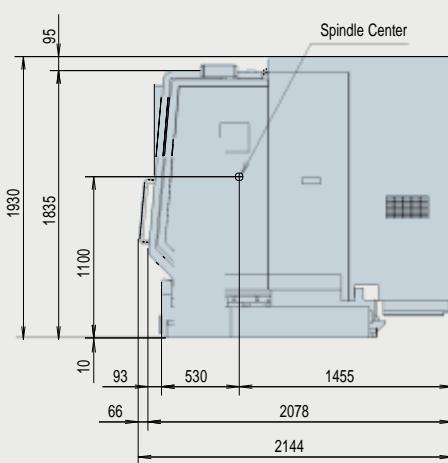
Machine Specifications

Description		Unit	PUMA TL2000 [L]	PUMA TL2000M [LM]	PUMA TL2500 [L]	PUMA TL2500M [LM]
Capacity	Swing over bed	mm	600			
	Swing over saddle(Upper)	mm	430			
	Recom. Turning diameter	mm	210		255	
	Max. Turning diameter(Upper/Lower turret)	mm	370/240	350/240	370/240	350/240
	Max. Turning length	mm	600 [1000]			
	Bar working diameter	mm	ø65		ø76	
	Spindle speed	r/min	5000		4000	
Main Spindle	Spindle nose	ASA	A2#6		A2#8	
	Spindle bearing diameter (Front)	mm	110		130	
	Spindle through hole	mm	ø76		ø86	
	Cs Spindle Index angle	deg	-	360 (in 0.001)	-	360 (in 0.001)
Tail Stock	Quill diameter	r/min	100			
	Quill bore taper	ASA	MT#5			
	Quill travel	mm	120			
Carriage	Travel distance X1/2-axis	mm	X1 : 250 / X2 : 150			
	Z1/2-axis	mm	Z1 : 650 [1050] / Z2 : 630 [1030]			
	Rapid traverse X1/2-axis	m/min	20			
	Z1/2-axis	m/min	24			
Turret	No. of tool stations(Upper+Lower)	st	12 + 8			
	OD tool height	mm	25			
	Boring bar diameter	mm	40			
	Indexing time	s	0.15			
	Rotary tool spindle speed*	r/min	-	5000	-	5000
Motor	Left spindle motor(Int.)	kW	22 (10min)		26 (30min)	
	Rotary tool spindle motor*	kW	-	5.5	-	5.5
	Servo motor X1-axis	kW	3.0			
	X2-axis	kW	1.6			
	Z1-axis	kW	3.0			
	Z2-axis	kW	3.0			
	Coolant pump	kW	0.9			
Other	Electric power supply(Rated capacity)	kVA	42	43	50	52
	Machine height	mm	1930			
	Machine dimensions length	mm	3250 [3900]			
	width	mm	2118 [2144]			
	Machine weight	kg	7000 [8200]			

Note) [ ] : Long bed machines
* : Rotary tool spindle is available on only upper turret of TL2000M[LM] / TL2500M[LM].

Standard Feature

Absoulte positioning encoder	Hand tool kit (including small tool for operations)	Safety precaution name plates
Coolant supply equipment	Hydraulic power unit	Spindle oil cooling unit
Foot switch	Leveling jack screw & plates	Standard tool kit (tool holder & boring sleeve)
Front guard door inter lock	Lubrication equipment	Work light
Full enclosure chip and coolant shield	Manuals	

Optional Feature

Air gun	Chip bucket	Pressure switch for chucking pressure check
Automatic door	Collet chucks*	Proximity switches for chuck clamp detection
Automatic door with safety device	Dual chucking pressure	Signal tower (yellow, red, green)
Automatic power off	Hardened & ground jaws	Tail stock quill for built-in (dead) center
Automatic measuring system*(in process touch probe)	Hydraulic steady rest on lower turret	Tool monitorling system
Air blast for chuck jaw cleaning	Minimum quantity lubrication (MQL) system	Tool pre-setter(manual type, or auto type-renishaw mode)
Bar feeder interface	Oil skimmer	
Bar fuller	Parts catcher	

Design and specifications are subject to change without prior notice.
Doosan is not responsible for difference between the information in the catalogue and the actual machine.

NC Unit Specifications (DOOSAN Fanuc i series)

AXES CONTROL
- Control paths — 2 path
- Control axes — X1, Z1, C1, X2, Z2
  - X1, Z1, X2, Z2 (TL 2000/L/2500/L)
  - X1, Z1, C1, X2, Z2 (TL 2000M/LM/2500M/LM)
- Simultaneous controlled axes — 4 axes
- Axis control by PMC
- Backlash compensation — 0 ~ ± 9999 pulses
- Backlash compensation for each rapid traverse and cutting feed
- Chamfering on/off
- Cs contouring control
- Emergency stop
- Follow-up
- HRV2 control
- Inch / Metric conversion
- Increment system 1/10 — 0.0001 / 0.00001 mm/inch
- Interlock — All axes / each axis
- Least input command — 0.001 / 0.0001 mm/inch
- Machine lock — All axes / each axis
- Mirror image
- Overtravel
- Position switch
- Servo off
- Stored stroke check 1
- Stored stroke check 2, 3
- Torque control
- Unexpected disturbance torque detection function
- Stroke limit check before move
- Stored pitch error compensation

OPERATION
- Automatic operation (memory)
- MDI operation
- DNC operation
- Buffer register
- Dry run
- Handle incremental feed — X1, X10, X100
- Manual Handle interruption
- Program restart
- JOG feed
- Manual handle feed — 1 unit
- Manual pulse generator — 1 ea
- Manual reference position return
- Program number search
- Reference position shift
- Refernce position setting without dog
- Sequence number search
- Single block
- Wrong operation prevention

INTERPOLATION FUNCTIONS
- Nano interpolation
- Positioning — G00
- 1st. Reference position return — Manual, G28
- 2nd. Reference position return — G30
- 3rd / 4th Ref. position return

- Balance cutting
- Circular interpolation — G02
- Continuous threading
- Cylindrical interpolation
- Dwell (per sec) — G04
- High Speed Skip Function
- Linear interpolation — G01
- Multiple threading
- Polar coordinate interpolation
- Polygon turning
- Polygon Turning With Spindles
- Reference position return check — G27
- Skip — G31
- Thread cutting / Synchronous cutting
- Thread cutting retract
- Torque limit skip
- Variable lead threading

FEED FUNCTION
- Automatic acceleration / deceleration
- Cutting feedrate clamp
- Feed per minute
- Feed per revolution
- Feedrate override (10% unit) — 0 - 200 %
- Jog feed override (10% unit) — 0 - 2000 mm/min
- Manual per revolution feed
- Override cancel
- Rapid traverse override — F0, 25, 100 %
- Rapid traverse rate
- Tangential speed constant control

AUXILIARY / SPINDLE SPEED FUNCTION
- Spindle orientation
- Actual spindle speed output
- Auxiliary function lock
- Constant surface speed control
- High speed M/S/T interface
- M - code function — M3 digits
- Multi spindle control
- Rigid tapping
- S - code function — S4 / S5 digits
- Spindle serial output — S4 / S5 digits
- Spindle speed override — 0 - 150 %
- Spindle Output switching
- Waiting function

PROGRAM INPUT
- Absolute / incremental programming
- Additional Macro Variables — #100~#199, #500~#999
- Automatic coordinate system setting
- Canned cycle for drilling
- Canned cycle
- Circular interpolation by R programming
- Control in / out
- Coordinate system setting — G50
- Coordinate system shift
- Custom macro

- Decimal point programming / Pocket calculator type decimal point programming
- Diameter/radius programming (X axis)
- Direct drawing dimension programming
- Direct input of coordinate system shift
- G code system A/B/C
- Input unit 10 time multiply
- Label skip
- Manual absolute on and off
- Max. programmable dimension — ± 9 digit
- Multiple repetitive cycle — G70 - G76
- Multiple repetitive cycle II
- Optional block skip — 9 pieces
- Parity check
- Plane selection — G17, G18, G19
- Program stop / end (M00, M01 / M02, M30)
- Programmable data input — G10
- Sequence number — N5 digit
- SUB program call — 10 folds nested
- Tape code — EIA / ISO
- Tape format for FANUC Series10/11
- Work coordinate system — G52 - G59
- Interruption type custom macro
- Chamfering / Corner R

TOOL FUNCTION / TOOL COMPENSATION
- Automatic tool offset
- Direct input of offset value measured
- Direct input of offset value measured B
- T - code function — T2 +2 digits
- Tool geometry / wear compensation
- Tool life management
- Tool radius / Tool nose compensation
- Tool offset — G43, G44, G49
- Number of Tool Offsets — 200 pairs
- Tool offset value counter input
- Tool Load Monitoring system

EDITING OPERATION
- Background editting
- Memory card edit & operation
- Extended part program editing
- Number of registered programs — 400 ea
- Part program editing
- Part program storage size — 1280m (512KB)
- (Note) Specify total of part program storage size of each path
- Program protect
- Playback Function

SETTING AND DISPLAY
- Actual cutting feedrate display
- Alarm display
- Alarm history display
- Current position display
- Directory display and punch for each group
- Directory display of floppy cassette
- Periodic maintenance screen

- Display of spindle speed and T code at all screens
- Help function
- Optional path name display
- Multi-language display
- Operation history display
- Parameter setting and display
- Program comment display — 31 characters
- Run hours / part count display
- Self-diagnosis function
- Servo setting screen
- Spindle setting screen
- Status display
- External key input
- External data input
- Operating monitor screen
- Servo waveform display

DATA INPUT / OUTPUT
- External program input
- External program number search
- External work number search
- Memory card input/output
- Reader / puncher interface
- RS232C interface
- Automatic data backup

OTHERS
- Cycle start and lamp
- Display unit — 10.4" Color TFT LCD
- Feed hold and lamp
- PCMCIA port in the front of LCD display unit
- NC and servo ready
- PMC system — 0iD-PMC
- Reset / rewind

INTERFACE FUNCTION
- Ethernet function — Embedded ethernet

OPERATION GUIDANCE FUNCTION
- EZ Guidei (Conversational Programming Solution)

OPTIONAL SPECIFICATIONS

OPERATION
- Manual tool retract and return

INTERPOLATION FUNCTIONS
- Multi step skip
- Helical interpolation

FEED FUNCTION
- Advanced preview control

DATA INPUT/OUTPUT
- Fast ethernet
- Data server

CONTOURING FUNCTION
- AICC I — 30 blocks

ROBOT INTERFACE
- Robot interface with PMC I/O module (Hardware between PMC I/O modules)
- Robot interface with PROFIBUS-DP

NC Unit Specifications (Fanuc 31i-A)

AXES CONTROL
- Control paths — 2 path
- Control axes
  - X1, Z1, X2, Z2 (TL 2000/L/2500/L)
  - X1, Z1, C1, X2, Z2 (TL 2000M/LM/2500M/LM)
- Simultaneous controlled axes — 4 axes
- Axis control by PMC
- Backlash compensation — 0 ~ ± 9999 pulses
- Backlash compensation for each rapid traverse and cutting feed
- Chamfering on/off
- Cs contouring control
- Emergency stop
- Follow-up
- HRV2 control
- Inch / Metric conversion
- Interlock — All axes / each axis
- Least input command — 0.001 / 0.0001 mm/inch
- Machine lock — All axes / each axis
- Mirror image
- Over travel
- Position switch
- Servo off
- Stored stroke check 1
- Unexpected disturbance torque detection function
- Stored pitch error compensation

OPERATION
- Automatic operation (memory)
- MDI operation
- DNC Operation with Memory card
- Buffer register
- Dry run
- Incremental feed — X1, X10, X100
- Program restart
- Wrong operation prevention
- JOG feed
- Manual handle feed — 1 unit
- Manual pulse generator — 1 ea
- Manual reference position return
- Program number search
- Refernce position setting without dog
- Sequence number search
- Single block
- Reference position shift

INTERPOLATION FUNCTIONS
- Nano interpolation
- Positioning — G00
- 1st. Ref. position return — Manual, G28
- 2nd. Ref. position return — G30
- Balance cutting
- Circular interpolation — G02
- Continuous threading
- Cylindrical interpolation
- Dwell (per sec) — G04
- Linear interpolation — G01
- Multi threading
- Polar coordinate interpolation
- Reference position return check — G27
- Skip — G31
- Thread cutting / Synchronous cutting

- Thread cutting retract
- Torque limit skip

FEED FUNCTION
- Automatic acceleration / deceleration
- Cutting feedrate clamp
- Feed per minute
- Feed per revolution
- Feedrate override (10% unit) — 0 - 200 %
- Jog feed override (10% unit) — 0 - 2000 mm/min
- Manual per revolution feed
- Override cancel
- Rapid traverse override — F0, 25, 100 %
- Tangential speed constant control

AUXILIARY / SPINDLE SPEED FUNCTION
- Spindle orientation
- Actual spindle speed output
- Constant surface speed control
- High speed M/S/T interface
- M - code function — M3 digits
- Multi spindle control
- Rigid tapping
- S - code function — S4 / S5 digits
- Spindle serial output — S4 / S5 digits
- Spindle speed override — 0 - 150 %
- Spindle Output switching
- Waiting function

PROGRAM INPUT
- Absolute / incremental programming
- Automatic coordinate system setting
- Canned cycle for drilling / Turning
- Canned cycle for turning
- Circular interpolation by R programming
- Control in/out
- Coordinate system setting — G50
- Coordinate system shift
- Custom macro
- Decimal point programming / Pocket calculator type decimal point programming
- Diameter / radius programming (X axis)
- Direct drawing dimension programming
- Direct input of coordinate system shift
- G code system A
- Input unit 10 time multiply
- Label skip
- Macro executor
- Manual absolute on and off
- Max. programmable dimension — ±9 digit
- Multiple repetitive canned cycle — G70 - G76
- Multiple repetitive canned cycle II
- Optional block skip — 9 pieces
- Parity check
- Plane selection — G17, G18, G19
- Program file name — 32 characters
- Program stop / end (M00, M01 / M02, M30)
- Programmable data input — G10
- Sequence number — N8 digit
- SUB program call — 10 folds nested
- Tape code — EIA / ISO
- Tape format for FANUC Series15

- Work coordinate system — G52 - G59

TOOL FUNCTION / TOOL COMPENSATION
- Automatic tool offset
- Direct input of offset value measured
- Direct input of offset value measured B
- T - code function — T2 +2 digits
- Tool geometry / wear compensation
- Tool life management
- Tool nose radius compensation
- Tool offset — G43, G44, G49
- Number of Tool Offsets — 64 pairs
- Tool offset value counter input
- Tool Load Monitoring system

EDITING OPERATION
- Back ground editing
- Memory card edit & operation
- Extended part program editing
- Number of registered programs — 500 ea
- Part program editing
- Part program storage size — 256 Kbyte
- (Note) Specify total of part program storage size of each path
- Program protect

SETTING AND DISPLAY
- Actual cutting feedrate display
- Alarm display
- Alarm history display
- Current position display
- Periodic maintenance screen
- Display of spindle speed and T code at all screens
- Help function
- Optional path name display (Only for 2path)
- Multi-language display — English
- Operation history display
- Parameter setting and display
- Program comment display — 31 characters
- Run hours / part count display
- Self-diagnosis function
- Servo setting screen
- Spindle setting screen
- Status display
- Operating monitor screen
- Servo waveform display
- Directory display of floppy cassette

DATA INPUT / OUTPUT
- External key input
- External data input
- External work number search
- Memory card input/output
- Reader/puncher interface — CH1 interface
- RS232C interface
- Automatic data backup
- Screen hard copy

OTHERS
- Cycle start and lamp
- Display unit — 10.4" Color TFT LCD
- Feed hold and lamp
- MDI unit
- NC and servo ready
- PMC system — 31iA-PMC

- Reset / rewind

INTERFACE FUNCTION
- Ethernet function — Embedded ethernet

OPERATION GUIDANCE FUNCTION
- EZ Guidei (Conversational Programming Solution)

OPTIONAL SPECIFICATIONS

AXIS CONTROL
- Chuck and tail stock barrier
- Stored stroke 2 and 3
- Stored limit check before move

OPERATION
- DNC operation
- Manual handle feed — 2 units
- Handle interruption
- Tool retract and recover
- Real time custom macro
- Active block cancel function
- Change active offset with manual move
- Manual tool retract and return

INTERPOLATION FUNCTIONS
- 3rd / 4th reference position return
- Circular threading
- Multi step skip
- Polygon Turning with Spindles
- Helical interpolation
- High Speed Skip Function

FEED FUNCTION
- External deceleration
- Feed stop

PROGRAM INPUT
- Work Coordinate System — 48 / 300 pairs
- Automatic corner override
- Interruption type custom macro
- Pattern data input
- Work coordinate system preset
- Chamfering / corner R
- Additional macro variables — #100~#199, #500~#999

TOOL FUNCTION / TOOL COMPENSATION
- Addition of tool pairs for tool life management
- Number of Tool Offsets — 99/200/400/499/999/2000 pairs

EDITING OPERATION
- Number of registered programs & Part program storage length

1280M (512KB)	1000 ea	2560M (1MB)	1000 ea
20480M (8MB)	4000 ea	20480M (8MB)	1000 ea
1280M (512KB)	1000 ea	10240M (4MB)	4000 ea
10240M (4MB)	1000 ea	5120M (2MB)	4000 ea
5120M (2MB)	1000 ea	640M (256KB)	500 ea
		2560M (1MB)	2000 ea

- Playback Function

DATA INPUT / OUTPUT
- Fast ethernet / Data server — Only for 1 path

CONTOURING FUNCTION
- AICC I — 30 blocks
- AICC II — 80 / 200 / 600 blocks

ROBOT INTERFACE
- Robot interface with PMC I/O module (Hardware between PMC I/O modules)
- Robot interface with PROFIBUS-DP

PUMA TL 2000/2500

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